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to
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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED, (M.S.) INDIA

Entitled

"INTEGRATED MANAGEMENT OF SEED BORNE PATHOGENS OF SOYBEAN"

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1) Proposed topic of research

Integrated Management of seed borne pathogens of Soybean (*Glycine max*)

2) Introduction

Soybean is one of most important pulse as well as oil seed crop.It is 4th most important crop in the world in terms of area harvested and production. It is cultivated in kharif season. The botanical name of soybean is *Glycine max*. It is the rich source of vegetable oil. Soybean belongs to legume crop family. The characteristic features of legume is the presence of root and root nodule, that contains nitrogen fixing bacteria.

The soybean is basically native to East Asia. The name of soybean come from chainese name 'shu'or 'sau'. The glycine max is cultivated as ancient crop is in north east china. Later it was spread towards South, after that it comes in Europe in 1712 then in USA by 1804 in Brazil by 1920 in east Africa by 1907 (Mali and Thottappilly,1990). Soybean was introduced in India in 1870 -1880(Androlle1884). Cultivation of soybean was initiated on large-scale after the second world war due to its nutritional value and multinutritious uses (Synder and Kwon, 1987).

According to the official standard of USA soybean has been classified into five classes as yellow, green, brown, black and mixed. Now a days soybean is mostly cultivated in most part of the world. About 40% of the edible oil came from soybean. Soybean is also commonly called as 'Gold of the soil'. Soybean oil is popularly used as edible oil in India. It provides cholesterol free oil (20%) and high quality protein (42%). It is rich in vitamins (vitamin B including folate), amino acids, essential fatty acids (omega 3 fatty acid, alpha linolenic acid), fibre, phytochemicals and lecithin. Lecithin is an emulsifier used in pharmaceuticals, cosmetics, paint ,plastic, food(in the manufacture of margarine, bakery goods ,and chocolate product) and also in compounds for animal feed .Consumption of soybean help to reduce cholesterol and prevent and manage certain types of cancer, kidney diseases, osteoporosis, diabetes and obesity. Soymilk and tofu do not contain lactose, saturated fat or cholesterol. This makes soymilk an excellent substitute for animal milk and milk products, which do contain lactose, saturated fat and cholesterol and often contain antibiotics. Defatted soyflour rich in protein and mixed with cereal flour in a ratio of 1:3, is a healthy dietary supplement for vegetarian population. Food manufacturers add small amount of soyflour to their baked goods to extend shelf life. Soybean oil is also used in industrial lubricant and in printing ink. Soybean -oil -based paints, cosmetics and biodegradable crayons are bio friendly alternatives. Soydiesel and similar by product are environmentally friendly replacement for their petroleum based counter parts. Soybean is cheap source of protein for

animal feeds. The crop produces enormous amount of biomass there by enhances the soil organic matter status in the soil. Therefore, it minimizes soil erosion.

Soybean grows best in warm and moist climate. It grows in various types of soil ranging from light sandy to black soil. Best results have however been observed in alluvial soil. For optimum yield pH range is reported to be from 6 to 6.5. Soybean is found to be sensitive to alkaline soil. Soybean is very sensitive to dry length. It requires a short photoperiod of 13 hrs. Or less for flower development optimum temperature for most cultivers is 30-33^{0}C day temperature (Weise,1978). A 500-800mm rainfall is necessary to produce high yield (Voldang et al.,1978).

Soybean is the largest over amongst the Indian food crops, farming the staple for the poor classes in relatively dry states of central and southern India, assuring there by its vital role in rural economy of the India. Major soybean growing states in India are Madhya Pradesh, Uttar Pradesh, Himachal Pradesh, Gujarat, Sikkim, Meghalaya, Nagaland, Rajasthan, West Bengal and Arunachal Pradesh. In India, Madhya Pradesh is known as "Soya –Bowl" of the country. It is found that cultivation of soybean has been increasing in Maharashtra and Rajasthan gradually.

Table. 1: Production of soybean in India from last five years (2017-2021)

Year of production	Yield in Million Metric Tonnes (MMT)
2021	**12.61**
2020	**11.22**
2019	**13.27**
2018	**10.93**
2017	**13.16**

(www.statista.com)

Table.2: Production of soybean in Maharashtra from last five years (2017-2021)

Year of production	Yield in Million Metric Tonnes (MMT)
2021	**48.35**
2020	**45.446**
2019	**39.415**
2018	**34.343**
2017	**29.003**

(www.sopa.org)

Scientific classification:

Kingdom :- Plantae

Division : - Angiosperms

Class : - Magnoliopsida

Order : - Fabales

Family : - Fabaceae

Genus : - *Glycine*

Species : - *max.*

3) Review of literature

Diseases and seed mycoflora

Bhikane (1988) reported *Alternaria alternata, Alternaria tenuis, Aspergillus flavus, Aspergillus niger,Boliylissp.,Chetomiumglobusum,Cladosporiumherbarum. ,.Curvularialunata,C.palescens, Drechsler atetrameram,Aspergillus moniliforme, Macrophomina phaseolina, Pecnicillium sp., Phomaexqua. Phytopthora sp.,Phytium sp. Rhizoctoniasolani, Rhizopus stolonifer. Svncephalastraum sp*. As seed mycoflora in green gram, and *Alternania alternata, A.tenuis, Stemphillium sp., Aspergillus flavus, A niger, A carhoniferus, Cladosporium herbarum, Chaetomium globosum, Curvularia lunata, Drechsleara tetramera, Fusaarium monilforme, Fusaarium oxvsporum. Fusaariumsemtectum, Fusaariumroseum.Macrophominaphaseolna, Mvrothecium rorideum, Penicillium sp., Phomaexique, Phytopathora sp., Phvtium sp. Rhizoctonia solani, Rhizopus stolonifer, Syncephastrum sp., Trichoderma viride* and *sterile mycellium*were detected from black gram seeds.
Erzyrum and Iren (1990) were studied the seed borne diseases of soybean and stated that 51 fungi (32 genera) were determinated in 88 seed samples from seven regions. 20 fungi were known to be seed-borne. *Strephyliumbotryosum*and*Phomamedicagints* were newly recorded on soybean seeds.

Agrawal and Gupta (1991) studied the fungi pathogens detected from soybean seeds in different localities. The seed mycoflora of 200 seeds of 16 soybean varieties from Jabalpur. Junagarh.Navarasi, Parbhani. Akola and Pune from M.P. Gujarat and Maharashtra States of India was investigated. The seed mycoflora includes in a *Macrophomina phaseolina ,Colletotrichum dematium and Aspergillus flavus.*

Franca Neto and West (1991) were detected *Colletotrichum truncatum* and *Cercospora kikuchii* from seeds of soybean and studied their effect on viability and quality in soybean seed.

Muthe gowad and Sullia (1991) detected the seed mycoflora of cowpeas. Field bean and soybean and observed that 53 fungal species were isolated from these crops of which 41 were from cowpea.32 from field bean and 38 from soybean. *Deuteromycetes*, *Aspergillus* and *Penicillium* were predominant. Most of the species were common to all these legumes.

Sampangiramaiah (1993) have delected seed mycoflora of soybean obtained from All India Co-ordinated Research Project and showed that *Alternaria sp., Aspergillus sp., Fusarium sp., Mucor sp., Penicillum sp.*,unidentified bacterium and sterile fungi were generally found associated withthe seeds of soybean. Pant and Mukhopadhya (1998) reviewd the pathogenic fungi of soybean associated with seed and seedlings. It was found that *Rhizocioniasolani. Sclerotium rolfsii, Macrophomia phaseolina and Fusarium sp.* were frequently isolated from diseased seeds and seedlings of soybean. Naik et al. (1998) were observed the *Alternariasp.* associated with soybean seeds. *Alternanria alternate* and *Alternaria tenuissima* found to be associated with the soybean seeds. It was confirmed that the infection resulted in brownish discolouration of seed coal.

Fungicidal control

Sundaresh et al. (1988) have tested the soybean seeds affected by seed-borne fungi with chemicals and found that seed treated with thiram or dithane M-45 gave good control of seed-borne fungi including *Aspergillus sp., Pencillium sp., Fusarium sp., Macrophomina sp.. Alternaria and Rhizopus sp*.

Kawale et al. (1991) were observed the effect of nine combination of fungicides an insecticide and herbicide on soybean seeds. It was found that all pesticide treatments increased seedling emergence.

Pardeshietal (1989) shown that the effect of different fungicidies on seedling vigour and seed viability in soybean. The fungicidies used were mancozeb, bavistin. thiram. Difotlan, vitavax and captan. It was found that thiram, carbendazim and captafol were most effective.

Singh and Agrawal (1990) were studied the effect of fungicides on germination and nodulation of soybean. Among seven treatments treated difoltan and thiram resulted the highest seedling emergence.

Biological control

Datnoff and Sinclair (1988) while studying the interaction of *Fusarium oxysporum* and *Rhizoctonia solani* causing root rot of soybean found that the disease incidence was lower when they are in mixture and disease incidence was more when they are alone.

Dubey and Dwivedi (1990) have shown the antagonism between *Macrophomina phaseolina* and some *rhizosphere micro fungi* of soybean including *Aspergillus flavus, Aspergillus fumigates, Aspergillus niger, Aspergillus terras., Cladosporium cladosporioides, Penicillum citrinum, penicillium javanicum* and *Trichoderma viride.*

Balsundram and Sarbhoy (1991) found that there was inhibition of seven soybean pathogens i.e. *Sclerotium rolfsii, Aspergillus semitectum, Fusarium solani, Fusarium sp., Rhizoctonia bataticola*. *Rhizoctonia solani* and *Xanthomonas campestris* due to treatment of *Rhizobium japonicum* as a biocontrol agent.
Fernander (1993) have shown the effect of *Trichoderma harzianum on Fusarium sp. Glonerella glycines* and *Macrophomina phaseolina* which occur in soybean plants. Fernander (1993) have shown the effect of *Trichoderma harzianum* on *Fusarium sp. Glonerella glycines* and *Macrophomina phaseolina* which occur in soybean plants.

Jeyrajan and Ramkrishnan (1995) were formulated Trichoderma viride for dry seed treatment of oil-seeds and pulses. *Trichoderma viride* was developed using fermented gown bio-mass in molasses yeast medium. It was applied 49/kg seed in cotton and groundnut. As a result of seed treatment, the plants recorded improved growth.

Medicinal Plants extract

Kareappa and Sangan (1996) were found the treatment of extract of Glossocardia bosvallea to infected seeds of Jowar shows more inhibitory effect than carbendazim. The seed-borne pathogens were Aspergillus flavus, Aspergillus tenuis, Fusarium oxysporum and Rhizopus stolonifer. They have used 1% carbendazim and 1% plant extracts shows more efficacy against seed borne pathogens. Plant extracts shows more efficacy than the fungicides .

Shivpuri et al. (1997) proved the effect of ten plant ethanol extracts including Allium cepa, Allium sativum, Azardirachta indica., Calotropis procera, Dhatura stramonium,Ocimum sanctum, Polyalthia longifolia, Tagetus erecta,Vinca rosea and Withania somnifera. These were having fungitoxic properties against five pathogenic fungi i.e.A.brassicila,C.capsici, Fusarium oxysporum, Rhizobium nodulation and grain completely.

Karde et al. (2000) also used the plant extract of Glossocardia bosvallea to study the effect on seed mycoflora of Pennisetum typhoides. It was found that plant extracts inhibits the seed-borne pathogens. It was also realized that seed–borne pathogen inhibition was more than commercial fungicides thiram.

4). Research problem

1. Study the disease responsible for low productivity of soybean and proper management of seed borne pathogen.
2. Comparative accounts of seed health management between chemical and biological control.

5) Significance of research

1).The present investigation will be helpful in control ofseed-borne parhogens ofsoybean.

2) The utilization of these treatment and methods, seeds can be stored for longer time and diseases can be prevented as well as controlled.

3) This investigation will be useful in increasing productivity as well as storerability of soybean seeds.

4) This detailed study enabled for analysis of various different parameters in terms of growth and yield of soybean over integrated management of seed borne pathogen of soybean**.**
5) Analysis of the economic losses due to seed borne pathogens involves consideration of the impact on seed production and distribution industry.

6) Objectives

This investigation will be useful to control seed borne pathogen soybean and in increasing productivity as well as inducing early emergence of seedling with following objectives:

- Collection of infected seeds of different varieties to know the varietal variation in relation with seed borne pathogens.
- Isolation and purification to prove the pathogenicity and for integrated management of seed borne pathogen.
- Detection of seed borne pathogens by different methods for screening ofseed mycoflora of different varieties.
- Seed treatment with different fungicides and plant extracts to suggest integrated management of seed borne pathogens.
- The biochemical changes occurring during seed infection.
- This investigation gives guidelines for integrated management of seed borne diseases of soybean.

7) Hypothesis

- The use of less chemicals to control and manage diseases.
- More use of biological control methods which will help to manage disease as well as increase the fertility of soil and production also increased.

8) Material and Method

A] Mycoflora of soybean seeds and its assessment:

Collection of seed samples and detection of Seed Mycoflora for the present study seed samples of soybean collected from marathwada . Seed samples collected from market of will be considered as treated seed samples and samples collected from farmers will be considered as untreated seed samples.

The seed mycoflora would be isolated by using different methods such as Standard blotter paper method, Agar plate method, Rolled paper towel method and Seed washates as recommended by International Seed Testing Association ISTA (1966), De Tempe (1953), Neergaard (1973) and Agrawal (1976).Observations will be recorded in percent incidence of seed borne fungi associated with unsterilized seeds. The fungi which appeared on seed would be isolated in pure culture for identification and for further study.

B) Determination of bio-deterioration of soybean seeds due to fungal pathogens:

C) Chemical control

Different fungicides used as a source of controlling agents of fungal pathogen.

D) Biological control of seed borne pathogens:

Medicinal plant extracts

Medicinal plants have been used as a source of medicine from ancient times. The widespread use of herbal remedies and healthcare preparation are described in ancient text, such as the Vedas and Bible. These are obtained from commonly used traditional herbs and medicinal plants and have been traced to the occurrence of natural products with medicinal properties.

The plants selected for further study will be *Aloe vera.,Dhatura stramonium L., Phylanthus emblica L.,Mentha piperata, Zingiber officinalis L., Azardiracta indica A, Juss.,Ocimum sanctum L.,Vitex negundo L., Tridex procumbensL.,Polyalthia longifolia (Sonner) Thw.* ,etc.

9) Statistacal analysis

The statistical analysis of the obtained data will be carried out by using the standard methods given by Panse, Sukhatme (1967) and Mungikar (1997).

10) Expected outcome

The present research work with detailed experimental study of integrated management of seed borne pathogen of soybean will be helpful to overcome the crises of edible oil by increasing yield of soybean and decrease the bio deterioration of seeds of soybean.

11) Plan of work

I Year:-Isolation of seed borne mycoflora from soybean seeds will be carried out. Slide preparation and scanning would be done as described by earlier workers. Also seed health testing of soybean due to the fungal attack will be assessed. Collection of literature on the concern research work will be carried out.

II Year:-In this year effectiveness of chemicals, medicinal plants and antagonists on fungal pathogens will be measured. Reference collection would be done as required extent. Collection of data obtained as a result of the previous experiment will be done. Scanning of slide would be completed.

III Year:-Calculation, tables, plotting of graphs, micro photographs, writing and other paper work will be done in the due course of time.

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